

REMARKS

This Amendment is submitted in response to the Final Office Action mailed on January 20, 2010, and the telephone interview courteously granted on April 8, 2010. Claims 36 and 38-51 are pending in the application. Claims 36 and 38-51 are rejected for alleged obviousness reasons, and the drawings have been objected to. Claims 1-37, 39, 41, 47 and 51 have been cancelled without prejudice or disclaimer. Claims 52-54 are newly added in place of cancelled independent Claims 36, 39 and 41. Claims 40, 42, 43, 44, 45, 50 and 51 are amended herein.

A Request for Continued Examination is submitted herewith. The Director is authorized to charge the RCE fee and any other fees which may be required, or to credit any overpayment to Deposit Account No. 02-1818. If such a withdrawal is made, please indicate the Attorney Docket No. 3712174-00470 on the account statement.

As mentioned above, the Office Action objected to the drawings. In particular, the Office Action objected to the drawings in that the features of “the second substrate, temporary adhesion layer on the second substrate, and the plurality of second devices of the temporary adhesion layer” are not shown in the drawings. However, Applicants respectfully submit that these features are shown in Figs. 1-4 where the same type of first substrate 1 and temporary adhesion layer 2 is used in subsequent transfer steps. In particular, the Specification describes, with regard to Figs. 13(A)-13(C): “[t]his embodiment is a device transfer method different from the above-described first embodiment in that the step of embedding devices into a pressure sensitive adhesive layer is repeated a number of times ... [t]he other steps are the same as in the first embodiment [i.e., Figs. 1-4] and, therefore, description thereof is omitted ... Fig. 13 illustrates the step of embedding devices 33R into a pressure sensitive adhesive layer 35 in this embodiment ... [t]he devices 33R are arranged on a temporary adhesion layer formed on a temporary holding substrate ... and then the temporary holding substrate and the transfer substrate 34 are brought closer to each other, thereby embedding the devices 33R into the pressure sensitive adhesive layer 35 ... [t]hereafter, as shown in Fig. 13(B), devices 33G which are light-emitting diodes for emitting light in green color are embedded at locations adjacent to the devices 33R by again following the procedure shown in Figs. 1 to 4, and, thereafter, devices 33B which are light-emitting diodes for emitting light in blue color are further embedded at

locations adjacent to the devices 33G.” Moreover, Fig. 13(B) illustrates the second devices 33G embedded next to the first devices 33R. (See, Specification, pgs. 36-37). Accordingly, Applicants respectfully submit that these claimed elements are shown in the Figures, and respectfully request withdrawal of the objection to the drawings.

In the Office Action, Claims 36, 38-39, 41-43, 45 and 47-51 are rejected under 35 U.S.C. §103(a) as being unpatentable over PCT Publication No. WO 02/084631 as evidenced by U.S. Patent No. 6,872,635 to Hayashi et al. (“Hayashi”) in view of U.S. Patent No. 5,426,342 to Nakamura et al. (“Nakamura”) and U.S. Patent No. 6,613,610 to Iwafuchi et al. (“Iwafuchi”). Also, Claims 40 and 44-46 are rejected under 35 U.S.C. §103(a) as being unpatentable over PCT Publication No. WO 02/084631 as evidenced by U.S. Patent No. 6,872,635 to Hayashi et al. in view of U.S. Patent No. 5,426,342 to Nakamura et al. and U.S. Patent No. 6,613,610 to Iwafuchi et al. as applied to claims 36, 38-39, 41-43, 45, and 47-51 above, and further in view of U.S. Patent Application Publication No. 2003/0227253 to Seo et al.

In response, Applicants have cancelled independent Claims 36, 39 and 41 in favor of new Claims 52-54, as mentioned above. These amendments were made for clarification purposes. In particular, as discussed during the telephone interview of April 8, 2010, the changes were made to clarify that the process of arranging devices on a temporary holding substrate and then embedding them into a transfer substrate is repeated one or more times while the entire pressure sensitive adhesive layer remains uncured. In view of the amendments and/or for at least the reasons set forth below, Applicants respectfully submit that the cited references fail to disclose or suggest each and every element of the present claims.

Independent Claims 52 and 53 similarly recite, at least in part, a method comprising: (a) arranging a plurality of devices on a temporary adhesion layer of a temporary holding substrate; (b) embedding the plurality of devices into a plurality of positions of an entirely uncured pressure sensitive adhesive layer provided on a transfer substrate by positioning the transfer substrate and the temporary adhesion substrate in close proximity thereof such that the temporary adhesion layer comes into contact with the pressure sensitive adhesive layer, and the plurality of devices become entirely embedded within the pressure sensitive adhesive layer so that the plurality of devices are substantially flush with the surface of the pressure sensitive adhesive layer, (c) repeating (a) and (b) at least once with a different plurality of devices, wherein for each

subsequent embedding step: (i) the entire pressure sensitive adhesive layer remains in an uncured state, and (ii) the different plurality of devices are embedded into different positions of the same pressure sensitive adhesive layer. Claim 54 similarly recited multiple transfer steps while the pressure sensitive adhesive layer remains in an uncured stated. The amendments are supported, for example, on pages 20-21 of the Specification, and as shown in Figs. 2-4 and 13(A) to 13(C).

An image display unit using light emitting devices such as light emitting diodes ("LEDs") is produced at a low cost by manufacturing a large number of LEDs from a single wafer. (See, Specification, paragraph 5, lines 1-4). Prior art display units are manufactured by rearranging a plurality of devices formed on a device formation substrate onto an apparatus substrate. (See, Specification, paragraph 6, lines 1-4). The devices are first transferred from the device formation substrate to an adhesive layer provided on a temporary holding substrate and then transferred from the temporary holding substrate to the apparatus substrate. (See, Specification, paragraph 6, lines 4-9). In transferring the devices from the temporary holding substrate to the apparatus substrate, an adhesive layer is provided between the temporary holding substrate and the apparatus substrate to adhere the two substrates to each other. (See, Specification, paragraph 7, lines 1-7). Before stripping the two substrates from each other, the adhesive layer is cured while the devices are embedded in it. (See, Specification, paragraph 7, lines 7-16). Due to the strong adhesion between the two substrates, stripping the two substrates from each other may cause damage to the substrates. (See, Specification, paragraph 7, lines 7-13). Furthermore, because the adhesive layer is cured or hardened before stripping, the apparatus substrate is damaged such that it may be difficult to subsequently transfer devices onto the same apparatus substrate. (See, Specification, paragraph 7, lines 14-18).

Therefore, the presently claimed invention provide a method of manufacturing an image display unit by embedding devices arranged on a first substrate into a pressure sensitive adhesive layer provided on a second substrate and stripping the devices from the first substrate before the pressure sensitive adhesive layer is hardened or cured, and where the entire pressure sensitive layer remains uncured for successive device transfer steps. The plurality of devices are arranged on the first substrate by bringing the devices into contact with a temporary adhesion layer provided on the first substrate. (See, Specification, paragraph 12, lines 1-5). The plurality of devices are collectively embedded within the pressure sensitive adhesive layer by positioning the

first and second substrates in close proximity to each other such that the plurality of devices penetrate the surface of the pressure sensitive adhesive layer. (See, Specification, paragraph 10, lines 6-10; Figure 3). Because the devices are embedded within the pressure sensitive adhesive layer rather than merely affixed to its surface, the devices may be mounted onto the second substrate independently of their shapes. (See, Specification, paragraph 10, lines 1-6). Furthermore, by stripping the devices from the first substrate while the entire pressure sensitive adhesive layer is still in an uncured state, the force required to separate the first and second substrates may be further reduced. (See, Specification, paragraph 10, lines 13-19). It is also possible to embed additional devices into the pressure sensitive adhesive layer by embedding the additional devices within the adhesive layer and stripping the additional devices from the substrate on which they are arranged before any portions of the pressure sensitive adhesive layer is cured. (See, Specification, paragraph 11, lines 1-6).

In contrast, the cited references fail to disclose or suggest every element of the present claims because they fail to disclose or suggest multiple transfers of different devices from a temporary adhesion substrate to be embedded in an uncured pressure sensitive adhesive layer, while keeping the entire pressure sensitive adhesive layer in an uncured state throughout all of the transfer steps, as recited in new Claims 52-54.

In this regard, in Fig. 2D of Hayashi, substrate 4 is not brought together with substrate 1 such that adhesive layer portions 5 come into contact with the adhesive layer 2, as claimed. Moreover, the only transfer method in Hayashi that discloses repeated transfer steps specifically requires curing after each step. For instance, with regard to Fig. 2D in Hayashi, Hayashi discloses in col. 11, lines 42-59:

“After the temporarily holding substrate 4 is superimposed to the transfer substrate 6, the adhesive layer 7 is partially irradiated with laser beams L from the back surface side of the transfer substrate 6, to selectively soften the adhesively layer 7, and then the selectively softened adhesive layer 7 is cooled to be thus cured, whereby the devices 3 are fixed to the adhesive layer 7. For example, as shown in FIG. 3, only a portion, being in contact with the device 3a to be transferred, of the adhesive layer 7 is selectively irradiated with the laser beams L from the back surface side of the transfer substrate 6, to be heated. As a result, only the heated region H of the adhesive layer 7 made from a thermoplastic

adhesive resin is softened, to exhibit an adhesive force against the device 3a. The irradiation of the laser beams is then stopped, and the heated region H is cooled to be cured, to fix the device 3a to the transfer substrate 6 via the adhesive layer."

With regard to the Nakamura reference, the Office Action merely relies on Nakamura for the alleged disclosure of a "heat sensitive and pressure sensitive adhesive layer." There is no disclosure or suggestion in Nakamura for repeated device transfer steps into a pressure sensitive adhesive layer while maintaining the entire pressure sensitive adhesive layer in an uncured state. Thus, Nakamura fails to cure the deficiencies of Hayashi, even assuming the references are properly combinable. (See, Office Action, pg. 3).

With regard to the Iwafuchi reference, as shown in Figs. 7 and 8, substrate 51 does not include a temporary adhesion layer formed thereon, as presently claimed. Rather, in order to release substrate 51 from the light emitting diodes, the sapphire substrate 51 is irradiated with a UV laser to decompose the second conductive type cladding layer 52 into nitrogen gas and metal gallium to weaken the bond between same. (See, Iwafuchi, col. 22, lines 1-14). Also, there is no disclosure or suggestion in Nakamura for repeated device transfer steps into a pressure sensitive adhesive layer while maintaining the entire pressure sensitive adhesive layer in an uncured state. Figs. 6-7 of Iwafuchi, as cited in point #7 on page 5 of the Office Action, only relate to a temporary holding substrate 60. This would appear to relate more to the presently claimed element of "arranging a plurality of devices on a temporary adhesion layer of a temporary holding substrate," and not to the remaining presently claimed features regarding repeated device transfer steps into a pressure sensitive adhesive layer while maintaining the entire pressure sensitive adhesive layer in an uncured state. Regarding the point #8 on page 5 of the Office Action, col. 27, lines 40-45 and col. 31, lines 54-60, both sections of Iwafuchi disclose curing the adhesive layer as soon as the device is transferred so that "the light-emitting diode 122 is fixed to the adhesive layer 125." There is no disclosure or suggestion of keeping the adhesive layer in an uncured state throughout one or more subsequent device transfer steps. As such, Iwafuchi fails to cure the deficiencies of Nakamura and Hayashi as discussed above, even assuming that all of the references are properly combinable.

Accordingly, Applicants respectfully request that the rejection of Claims 36, 38-39, 41-43, 45 and 47-51 under 35 U.S.C. §103(a) to Hayashi, Nakamura and Iwafuchi be withdrawn.

In the Office Action, Claims 40 and 44-46 are rejected under 35 U.S.C. §103(a) as being unpatentable over WO 02/084631 A1 to Hayashi et al. as evidenced by Hayashi in view of Nakamura, and further in view of U.S. Patent Application No. 2003/0227253 to Seo et al. ("Seo") and Iwafuchi. As discussed previously, Hayashi, Nakamura and Iwafuchi fail to disclose or suggest (a) arranging a plurality of devices on a temporary adhesion layer of a temporary holding substrate; (b) embedding the plurality of devices into a plurality of positions of an entirely uncured pressure sensitive adhesive layer provided on a transfer substrate by positioning the transfer substrate and the temporary adhesion substrate in close proximity thereof such that the temporary adhesion layer comes into contact with the pressure sensitive adhesive layer, and the plurality of devices become entirely embedded within the pressure sensitive adhesive layer so that the plurality of devices are substantially flush with the surface of the pressure sensitive adhesive layer, (c) repeating (a) and (b) at least once with a different plurality of devices, wherein for each subsequent embedding step: (i) the entire pressure sensitive adhesive layer remains in an uncured state, and (ii) the different plurality of devices are embedded into different positions of the same pressure sensitive adhesive layer as required, in part, by independent Claims 52 to 54, from which Claims 40 and 44-46 depend. The Examiner further relies on Seo merely for the disclosure of driving methods that include impressing a voltage on the devices through the first and second electric wirings. (See, Office Action, page 14). Thus, Applicants respectfully submit that Seo fails to remedy the deficiencies of Hayashi, Iwafuchi and Nakamura.

Accordingly, Applicants respectfully request that the rejection of Claims 40 and 44-46 under 35 U.S.C. §103(a) to Hayashi, Nakamura, Seo and Iwafuchi be reconsidered and withdrawn.

For the foregoing reasons, Applicants respectfully submit that the present application is in condition for allowance and earnestly solicit reconsideration of same.

Respectfully submitted,

K&L GATES LLP

BY 

Thomas C. Basso
Reg. No. 46,541
Customer No. 29175

Dated: April 19, 2010